

WHAT IS CLAIMED IS:

1. A ball grid array package stack comprising:

a lower package comprising a first circuit substrate comprising a first substrate portion, a second substrate portion, and a third substrate portion; a first integrated circuit chip attached on and electrically connected to a top surface of said first substrate portion, a first molding resin covering the top surface of said first substrate portion and said first integrated circuit chip; said second substrate portion being folded so that the third substrate portion is positioned on the upper surface of said molding resin, and

an upper ball grid array package comprising a second circuit substrate; a second integrated circuit chip attached on and electrically connected to a top surface of the second circuit substrate, interconnection terminals formed on a bottom surface of the second circuit substrate, and a ball grid array connecting said interconnection terminals to the third substrate portion of said first circuit substrate.

2. The ball grid array package stack of claim 1, comprising external connection terminals formed on a bottom surface of said first substrate portion, the external connection terminals being distributed over the bottom surface of the first substrate portion of the first circuit substrate.

3. The ball grid array package stack of claim 1, wherein the external connection terminals are solder balls.

4. The ball grid array package stack of claim 1, wherein the lower package further includes metal wires for electrically connecting the first chip and the first circuit substrate, and wherein the upper package further includes metal wires for electrically connecting the second chip and the second circuit substrate.

5. The ball grid array package stack of claim 1, wherein the first circuit substrate has first ball pads formed in said first portion to receive said external connection terminals, second ball pads formed in the third portion to receive the interconnection terminals, and connection lines connecting the first and the second ball pads.

6. The ball grid array package stack of claim 5, wherein the first circuit substrate further has a base layer on which the first and the second ball pads and the connection lines are formed, and a coating layer covering the base layer and the connection lines and having pad openings through which the first and the second ball pads are exposed.

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7. The ball grid array package stack of claim 6, wherein the external connection terminals are formed on the first ball pads through the pad openings, and the interconnection terminals are joined to the second ball pads through the pad openings.

10 8. A method for manufacturing a ball grid array package stack, the method comprising:

forming a lower ball grid package that has a foldable circuit substrate with a first substrate portion, a second substrate portion and a third substrate portion, comprising:

15 positioning an integrated circuit chip on a top surface of said first substrate portion and electrically connecting said circuit chip to first ball pads positioned on a bottom surface of said first substrate portion ;

applying a molding resin to cover said first substrate portion and said integrated circuit chip;

20 bending said second substrate portion so that said third substrate portion is positioned on the top surface of said molding resin, the top surface of said third substrate portion comprising top ball pads;

forming an upper ball grid package that includes a second integrated circuit positioned on a top substrate;

forming balls on ball pads on the bottom surface of said top substrate; and

25 positioning the upper ball grid package on the lower ball grid package so that the balls on the bottom surface of the upper ball grid package are aligned with the top ball pads on the top surface of said third substrate portion of the lower ball grid package.

30 9. The method of claim 8, further comprising applying flux to the first ball pads located on the bottom surface of the upper ball grid package and the second ball pads on the top surface of the third substrate portion before forming the balls on the ball pads.

10. The method of claim 8, wherein the balls between the upper and lower ball grid packages are solder balls.

11. The method of claim 10, further comprising reflowing the solder on the balls between the upper and lower ball grid packages so that these two packages are joined.

5 12. The method of claim 8, wherein said integrated circuits are electrically connected to said circuit substrate with metal wires.

13. A stacked ball grid array package comprising a first integrated circuit mounted on a first portion of a folded circuit substrate, said first integrated circuit being connected to a first array of connection balls, some of which are located under said first integrated circuit, a second integrated circuit positioned above a second circuit substrate, said second integrated circuit connected to a second array of connection balls located under said second circuit substrate, some of said second array of connection balls being located under said second integrated circuit, said second integrated circuit being positioned above said first integrated circuit, and a second portion of said folded circuit substrate that extends under, and is connected to, said second array of connection balls.

14. An integrated circuit package comprising:

a circuit substrate comprising a first substrate portion, a second substrate portion, and a third substrate portion, said second substrate portion being folded approximately 180 degrees so that said third substrate portion is positioned above said first substrate portion;

a bottom ball grid package comprising a first integrated circuit positioned on top of and connected to said first substrate portion, and first connection balls positioned on the bottom of said first substrate portion; and

a top ball grid package comprising a second integrated circuit, a top substrate, and second connection balls, said integrated circuit being positioned on top of and connected to said top substrate and said second connection balls being positioned on the bottom of said top substrate,

said top ball grid package being positioned above said bottom ball grid package so that said second connection balls are positioned on the top of and connected to said third substrate portion whereby both of said integrated circuits are connected to said circuit substrate.

15. The integrated circuit package of claim 14, wherein said connection balls are solder balls.

16. The integrated circuit package of claim 14, wherein said first substrate portion comprises electrical connections and said first connection balls are connected to said electrical connections.

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17. The integrated circuit package of claim 14, wherein said third substrate portion includes electrical connections and said second connection balls are connected to said electrical connections

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18. The integrated circuit package of claim 14, wherein said first substrate portion comprises electrical connections and said first integrated circuit is connected to said electrical connections.

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19. The integrated circuit package of claim 14, wherein said third substrate portion includes electrical connections and said second integrated circuit is connected to said electrical connections.

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20. The integrated circuit package of claim 14, wherein said first integrated circuit and said first substrate portion are covered with a molding resin and said bottom of said third substrate portion is positioned on top of said molding resin.

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21. The integrated circuit package of claim 14, further comprising metal wires connecting said first integrated circuit to said first substrate portion and metal wires connection said second integrated circuit to said top substrate.

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22. An integrated circuit package comprising a plurality of integrated circuits each integrated circuit being connected to an associated array of connection balls, some of which are located under the associated integrated circuit, said integrated circuits being positioned in a vertical stack, a plurality of folded circuit substrates, each folded substrate being folded so that there is a second substrate portion on top of a first substrate portion, each of said folded substrates comprising one of said integrated circuits position on top of and connected to its first portion and the connection balls that are associated with a different integrated circuit positioned on top of and connected to the top of its second portion, whereby multiple integrated circuits can be stacked and connected with some of the connection balls associated

with each particular integrated circuit being located directly underneath the particular integrated circuit.